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S/N 09/945535PATENTIN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Kie Y. Ahn et al.

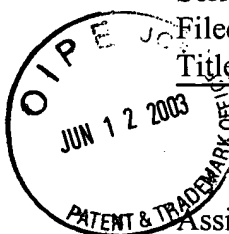
Examiner: David Blum

Serial No.: 09/945535

Group Art Unit: 2813

Filed: August 30, 2001

Docket: 1303.026US1

Title: HIGHLY RELIABLE AMORPHOUS HIGH-K GATE OXIDE ZrO₂**INFORMATION DISCLOSURE STATEMENT**

Assistant Commissioner for Patents

P.O.Box 1450

Alexandria, VA 22313-1450

In compliance with the duty imposed by 37 C.F.R. § 1.56, and in accordance with 37 C.F.R. §§ 1.97 *et. seq.*, the enclosed materials are brought to the attention of the Examiner for consideration in connection with the above-identified patent application. Applicants respectfully request that this Information Disclosure Statement be entered and the documents listed on the attached Form 1449 be considered by the Examiner and made of record. Pursuant to the provisions of MPEP 609, Applicants request that a copy of the 1449 form, initialed as being considered by the Examiner, be returned to the Applicants with the next official communication.

Pursuant to 37 C.F.R. § 1.97(b), it is believed that no fee or statement is required with the Information Disclosure Statement.

The Examiner is invited to contact the Applicants' Representative at the below-listed telephone number if there are any questions regarding this communication.

Respectfully submitted,

KIE Y. AHN ET AL.

By their Representatives,

SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH, P.A.

P.O. Box 2938

Minneapolis, MN 55402

(612) 373-6944

Date 6/10/03By [Signature]

David C. Peterson

Reg. No. 47,857

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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Commissioner of Patents, P.O.Box 1450, Alexandria, VA 22313-1450, on this 10th day of June, 2003

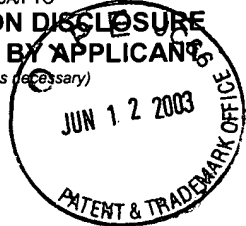
Name

Amy Morison

Signature

[Signature]

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**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
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Application Number	09/945535
Filing Date	August 30, 2001
First Named Inventor	Ahn, Kie
Group Art Unit	2813
Examiner Name	Blum, David

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Attorney Docket No: 1303.026US1

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US PATENT DOCUMENTS

Examiner Initial *	USP Document Number	Publication Date	Name of Patentee or Applicant of cited Document	Class	Subclass	Filing Date if Appropriate
	US-2002/0089023	07/11/2002	Yu, Z. , et al.	257	411	01/05/2001
	US-2002/0155688	10/24/2002	Ahn, K. Y., et al.	438	592	04/20/2001
	US-2002/0155689	10/24/2002	Ahn, K. Y., et al.	29	76	02/11/2002
	US-2002/0192974	12/19/2002	Ahn, Kie , et al.	438	722	06/13/2001
	US-2003/0017717	01/23/2003	Ahn, Kie , et al.	438	768	07/18/2001
	US-4,215,156	07/29/1980	Dalal, H. , et al.	427	84	08/26/1977
	US-4,399,424	04/16/1983	Rigby, L. J.	338	34	10/05/1981
	US-5,822,256	10/13/1998	Bauer, Mark , et al.	365	200	03/05/1997
	US-5,828,080	10/27/1998	Yano, Y. , et al.	257	43	04/17/1995
	US-6,013,553	01/11/2000	Wallace, Robert , et al.	438	287	07/15/1998
	US-6,171,900	01/09/2001	Sun, Shi-Chung	438	240	04/15/1999
	US-6,225,168	05/01/2001	Gardner, Mark , et al.	438	287	06/04/1998
	US-6,297,539	10/02/2001	Ma, Y. , et al.	257	410	07/06/2000
	US-6,303,481	10/16/2001	Park, Dong	438	591	12/29/2000
	US-6,368,941	04/09/2002	Chen, Tai-Ju , et al.	438	424	11/08/2000
	US-6,465,334	10/15/2002	Buynoski, Matthew S., et al.	438	591	10/05/2000
	US-6,495,436	12/17/2002	Ahn, Kie , et al.	438	591	02/09/2001
	US-6,521,911	02/18/2003	Parsons, Gregory N., et al.	257	52	07/19/2001

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Foreign Document No	Publication Date	Name of Patentee or Applicant of cited Document	Class	Subclass	T ²
	JP-2001-332546	11/30/2001		H01L	21/316	

OTHER DOCUMENTS -- NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No ¹	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T ²
		International Technology for Semiconductor Roadmap, (1999),	
		BRIGHT, A A., et al., "Low-rate plasma oxidation of Si in a dilute oxygen/helium plasma for low-temperature gate quality Si/Sio2 interfaces", <u>Applied Physics Letters</u> , (February 1991), pp. 619-621	

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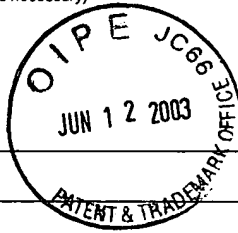
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		CHENG, BAOHONG, et al., "The Impact of High-k Gate Dielectrics and Metal Gate Electrodes on Sub-100nm MOSFET's", <u>IEEE Transactions on Electron Devices</u> , (1999), pp. 1537-1544	
		FUYUKI, TAKASHI, et al., "Initial stage of ultra-thin SiO2 formation at low temperatures using activated oxygen", <u>Applied Surface Science</u> , (1997), pp. 123-126	
		HIRAYAMA, MASAKI, et al., "Low-Temperature Growth of High-Integrity Silicon Oxide Films by Oxygen Radical Generated in High Density Krypton Plasma", <u>IEDM Technical Digest</u> , (1999), pp. 249-252	
		HUBBARD, K. J., et al., "Thermodynamic stability of binary oxides in contact with silicon", <u>J. Mater. Res.</u> , (11/1996), pp. 2757-2776	
		JEONG, CHANG-WOOK, et al., "Plasma-Assisted Atomic Layer Growth of High-Quality Aluminum Oxide Thin Films", <u>Japanese Journal of Applied Physics</u> , (January 2001), pp. 285-289	
		KAWAI, Y, et al., "Ultra-low-temperature growth of high-integrity gate oxide films by low-energy ion-assisted oxidation", <u>Applied Physics Letters</u> , (April 1994), pp. 2223-2225	
		KIM, C T., et al., "Application of Al2O3 Grown by Atomic Layer Deposition to DRAM and FeRAM", <u>International Symposium in Integrated Ferroelectrics</u> , (March 2000), pp. 316	
		KIM, Y, et al., "Substrate dependence on the optical properties of Al2O3 films grown by atomic layer deposition", <u>Applied Physics Letters</u> , (December 1997), pp. 3604-3606	
		LESKELA, M, et al., "ALD precursor chemistry: Evolution and future challenges", <u>Journal de Physique</u> , (1999), pp. 837-852	
		LIU, C. T., "Circuit Requirement and Integration Challenges of Thin Gate Dielectrics for Ultra Small MOSFETs", <u>IEDM</u> , (1998), pp. 747-750	
		LIU, Y C., et al., "Growth of ultrathin SiO2 on Si by surface irradiation with an O2+Ar electron cyclotron resonance microwave plasma at low temperatures", <u>Journal of Applied Physics</u> , (February 1999), pp. 1911-1915	
		MARTIN, P J., et al., "Ion-beam-assisted deposition of thin films", <u>Applied Optics</u> , (January 1983), pp. 178-184	
		MULLER, D. A., et al., "The electronic structure at the atomic scale of ultrathin gate oxides", <u>Nature</u> , vol.399, no.6738, 24 June 1999, (1999), pp. 758-61	
		NIEMINEN, MINNA, et al., "Formation and stability of lanthanum oxide thin films deposited from B-diketonate precursor", <u>Applied Surface Science</u> , (2001), pp. 155-165	
		OSTEN, H. J., et al., "High-k Gate Dielectrics with Ultra-low Leakage Current Based on Praseodymium Oxide", <u>IEEE</u> , (2000), pp. 653-656	
		PAN, TUNG M., et al., "High Quality Ultrathin CoTiO3 High-k Gate Dielectrics", <u>Electrochemical and Solid-State Letters</u> , (2000), pp. 433-434	

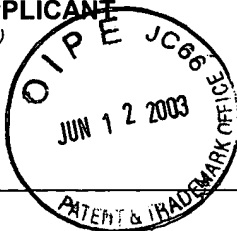
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		PAN, TUNG M., et al., "High-k cobalt-titanium oxide dielectrics formed by oxidation of sputtered Co/Ti or Ti/Co films", <u>Applied Physics Letters</u> , (March 2001), pp. 1439-1441	
		QI, WEN-JIE, et al., "MOSCAP and MOSFET characteristics using ZrO ₂ gate dielectric deposited directly on Si", <u>IEDM Technical Digest</u> , (1999), pp. 145-148	
		SAITO, YUJI, et al., "Advantage of Radical Oxidation for Improving Reliability of Ultra-Thin Gate Oxide", <u>2000 Symposium on VLSI Technology Digest of Technical Papers</u> , (2000), pp. 176-177	
		SAITO, YUJI, et al., "High-Integrity Silicon Oxide Grown at Low-Temperature by Atomic Oxygen Generated in High-Density Krypton Plasma", <u>Extended Abstracts of the 1999 International Conference on Solid State Devices and Materials</u> , (1999), pp. 152-153	
		SHIN, CHANG H., et al., "Fabrication and Characterization of MFISFET using Al ₂ O ₃ Insulating Layer for Non-Volatile Memory", <u>12th International Symposium in Integrated Ferroelectrics</u> , (March 2000), pp. 1-9	
		SZE, S M., <u>Physics of Semiconductor Devices</u> , (1981), p. 431	
		SZE, S M., <u>Physics of Semiconductor Devices</u> , (1981), p. 473	
		WOLF, STANLEY, et al., "Silicon Processing for the VLSI Era - Volume I: Process Technology", <u>Second Edition</u> , <u>Lattice Press</u> , Sunset Beach, California, (2000), page 443	

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